

Claims:

1. An underdrain block for an underdrain system supporting a filter media bed in a liquid filtration system, the underdrain block comprising:

- 5       an upper wall, side walls, and a lower wall;  
      at least one lateral member within the underdrain block between the upper wall and the lower wall;  
      at least two chambers within the underdrain block, each chamber being defined by the lateral member;  
10       a plurality of upper orifices in the upper wall of the underdrain block; and  
      a plurality of internal orifices in the lateral member;

      whereby the underdrain block is substantially greater  
15   in longitudinal length than a longitudinal distance between the upper orifices.

2. The underdrain block of claim 1 further comprising a conduit in the lower wall for effluent to flow out of the underdrain and for water and air to flow into  
20   the underdrain.

3. The underdrain block of claim 1 further comprising a passageway between an end of at least one chamber of the underdrain block and a wall sleeve, said  
25   wall sleeve providing a conduit for effluent to flow out of the underdrain and for water and air to flow into the underdrain.

4. The underdrain block of claim 1 for use in a filter bed, wherein the longitudinal length extends the  
30   length of the filter bed.

5. The underdrain block of claim 1, wherein the longitudinal length is at least 5 feet.

6. The underdrain block of claim 1, wherein the longitudinal length is at least 10 feet.

7. The underdrain block of claim 1, wherein the longitudinal length is at least 20 feet.

8. An improved liquid filtration system comprising:

(a) a filter bed comprising:

a layer of porous filter media; and

at least one layer of filter media situated on top of said layer of porous filter media;

(b) an underdrain situated underneath said layer of porous filter media, said underdrain having an upper wall and rails situated on said upper wall for engaging extruded members; and

(c) a plurality of extruded members having mating recesses for slidably engaging said rails of the underdrain whereby the extruded members are slidably attached to the underdrain;

9. The liquid filtration system of claim 8, wherein said plurality of extruded members further comprise receiving recesses for receiving said layer of porous filter media.

10. The liquid filtration system of claim 9, wherein said layer of porous filter media is comprised of one or more porous plates.

11. The liquid filtration system of claim 9, wherein said rails further comprise support rails on said upper wall of said underdrain for supporting said layer of filter media and said layer of porous filter media.

12. The liquid filtration system of claim 8, wherein said underdrain further comprises side walls and side rails located on said the side walls of the underdrain block, said side rails on one side wall being offset from the side rails on the other side wall of the underdrain block, said side rails provided to align a plurality of underdrain blocks side-to-side.

13. The liquid filtration system of claim 12, whereby said side rails of one underdrain block interlock with said side rails of an adjacent underdrain block.

14. The liquid filtration system of claim 8, wherein said underdrain further comprises a lower wall and said liquid filtration system further comprises:  
an air nozzle comprising a pipe having a closed end and an open end, said pipe having a first opening proximate the closed end,  
whereby said air nozzle extends from the lower wall of the underdrain block to an area proximate the upper wall of said underdrain block, said closed end being located at the lower wall.

15. The liquid filtration system of claim 14, wherein said pipe further comprises a second opening proximate the open end.

16. An improved liquid filtration system comprising:  
(a) a filter bed comprising:  
at least one layer of support media; and  
at least one layer of filter media situated on top of said layer of support media;  
(b) an underdrain situated underneath said layer of porous filter media, said underdrain further comprising a lower wall and an upper wall;  
said liquid filtration system further comprising:

an air nozzle comprising a pipe having a closed end and an open end, said pipe having a first opening proximate the closed end,

5       whereby said air nozzle extends from the lower wall of the underdrain block to an area proximate the upper wall of said underdrain block, said closed end being located at the lower wall.

17.   The liquid filtration system of claim 16, wherein said pipe further comprises a second opening proximate the open end.  
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18.   An underdrain block for an underdrain system supporting a filter media bed in a liquid filtration system, the underdrain block comprising:

15       an upper wall, side walls, and a lower wall, said walls defining an interior of said underdrain block;

20       three lateral members within the underdrain block comprising two vertical lateral member and one horizontal lateral member, said vertical lateral member dividing said interior of the underdrain block into three sections of approximately equal size, said horizontal lateral member intersecting said vertical lateral members such that said horizontal lateral member further divides the interior of the underdrain block into six chambers comprising three upper chambers of approximately equal size located above  
25       said horizontal lateral member and three lower chambers of approximately equal size located below said horizontal lateral member;

30       a plurality of upper orifices through the upper wall of the underdrain block; and

      a plurality of internal orifices through the horizontal lateral member;

      whereby a longitudinal length direction of the underdrain block is substantially greater than a longitudinal distance between the upper orifices.

19. The underdrain block of claim 18 further comprising:

a plurality of air nozzles located in each section of the underdrain and each located at different lengths along the length of the underdrain, each air nozzle comprising:

5 a pipe having a closed end and an open end, said pipe extending from the lower wall of said underdrain through an internal orifice into the upper chamber, said pipe having a vertical slot proximate the closed  
10 end and situated in the lower chamber substantially near the lower wall, said pipe further having a hole situated in the lower chamber substantially near the horizontal lateral member, said open end situated in the upper chamber substantially near the horizontal  
15 lateral member.

20. A method for manufacturing an underdrain block used in the construction of an underdrain system for supporting a filter media bed in a liquid filtration system, said method comprising the steps of:

20 (a) extruding an underdrain block from an extrudable polymeric material, said underdrain block having:

an upper wall;

a lower wall; and

25 at least one lateral member defining, either alone or in conjunction with the upper wall or the lower wall, at least two chambers within said underdrain block; and

(b) creating a plurality of upper orifices through the upper wall, said upper orifices defining passageways  
30 through the upper wall; and

(c) creating a plurality of internal orifices through the lateral member to provide a fluid passageway between the chambers.

21. The method of claim 20 for manufacturing an underdrain block, wherein step (c) is performed by creating a plurality of holes through the lower wall of said underdrain block to create the internal orifices through the lateral member, said method further comprising the additional step of:

plugging the plurality of holes in the lower wall of said underdrain block.

22. The method of claim 20 for manufacturing an underdrain block, said method further comprising the additional step of:

providing a passageway through the lower wall of the underdrain block, the passageway providing a conduit between the underdrain and a flume.

23. The method of claim 20 for manufacturing an underdrain block, said method further comprising the additional step of:

providing a passageway between an end of at least one chamber with the underdrain block and a wall sleeve, said wall sleeve providing a conduit for effluent to flow out of the liquid filtration system and for water and air to flow into the liquid filtration system.

24. A method of filtering an influent through a liquid filtration system, said system comprising: a filter basin having a bottom wall, an underdrain system below the bottom wall of said filter basin, the underdrain system having a plurality of underdrain blocks for transporting effluent away from the liquid filtration system, each underdrain block comprising:

an upper wall, side walls, and a lower wall of the underdrain block;

at least one lateral member within the underdrain block between the upper wall and the lower wall;

at least two chambers within the underdrain block, the chamber being defined by the lateral member;

a plurality of upper orifices through the upper wall of the underdrain block, wherein the upper orifices define passageways through the upper wall of the underdrain block such that an effluent that has been filtered through a filter media bed located above the upper wall of the underdrain can flow through the upper wall of the underdrain; and

a plurality of internal orifices through the lateral member, wherein the internal orifices define passageways through the lateral member such that an effluent that has been filtered through the upper wall of the underdrain can flow through the lateral member;

whereby the length along the longitudinal direction of the underdrain block is substantially greater than the longitudinal distance between the upper orifices;

the method comprising the steps of:

(a) introducing the influent into the filter basin;

and

(b) permitting the influent to flow downward through the filter media to produce a filtrate; and

(c) passing the filtrate through the upper orifices, the internal orifices, and the chambers of the underdrain system.

25. The method of filtering an influent through a liquid filtration system of claim 24 further comprising a backwashing process of washing the filter media bed comprising the steps of:

(c) after performing steps (a) and (b) repeatedly for an extent of time, pumping either pressurized water or air through the flume in a reverse direction into the underdrain system, through the chamber, the internal orifices, the upper orifices and into the filter media bed;

(d) after the water flows upwardly through the filter media bed and carries trapped materials upwardly from the

filter bed, thereby reaching a level substantially near the top of the filter basin, collecting the water and the materials entrained or suspended therein; and

5 (e) removing the water and the materials from the liquid filtration system.

26. A method of improving flow distribution in a multi-tier underdrain system, of a liquid filtration system during backwashing, the underdrain comprising at least one lower chamber, at least one upper chamber, and internal  
10 orifices defining passageways between the lower chamber and the upper chamber, the method comprising the step of:

installing baffles in selected areas in the lower chamber.

27. A method of improving flow distribution in a  
15 multi-tier underdrain system, of a liquid filtration system during backwashing, the underdrain comprising at least one lower chamber, at least one upper chamber, and internal orifices defining passageways between the lower chamber and the upper chamber, the method comprising the step of:

20 placing additional internal orifices between the upper chamber and the lower chamber.